CHEMICAL ENGINEERING

NEWS

Chemical capacity use continues to improve

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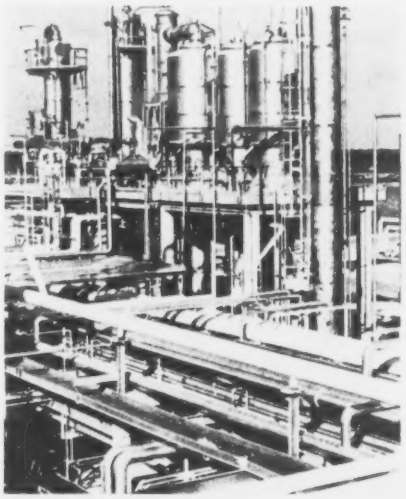

Business

U.S. chemical plant capacity use rates, after hitting bottom in first-quarter 1982, have been rising steadily in keeping with the demand in downstream markets. **Page 9**

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Chemical Plant Capacity Use Continues Steady Rise

Use rate for basic chemicals rose to 78% in third quarter from 72% in first quarter; polymers, however, fell again, slipping to 76% from 81%

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Ordinarily, the U.S. chemical industry's fortunes and woes pretty much parallel those of the general U.S. economy, but a disturbing drop in some chemical capacity use in the third quarter may challenge that trend.

After an up-and-down performance in 1980 and 1981, capacity utilization rates for chemical plants hit bottom in the first quarter of 1982. Since that time, they have been steadily rising as the U.S. general economy fueled demand in downstream markets. The rising trend continued in this year's third quarter for basic chemicals, but, whether because of seasonal factors or because of a real slowdown in markets, capacity use for polymers dropped. According to a twice-yearly survey of major chemical companies by C&EN, capacity use for basic chemicals rose to about 78% in the third quarter from 72% in this year's first quarter and 68% in third-quarter 1983. But for plastics and fibers, capacity use averaged 76%, down from 81% in this year's first quarter and from 82% in third-quarter 1983.

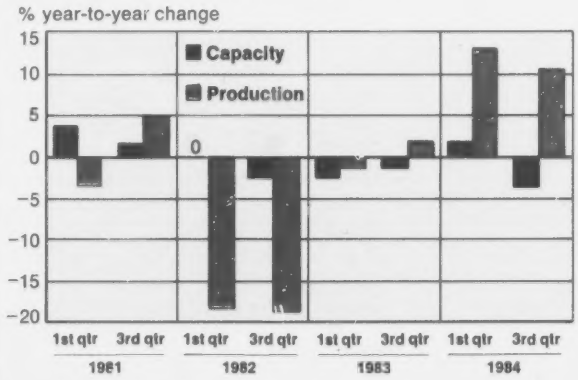
Capacity utilization is a key measure of the industry's health and is used as an indication of the need for new plant and increased capital spending. Although capacity utilization rates have been rising for the industry, however, capital spending has been lagging that for all manufacturing, according to government figures. Industry sources say that this anomaly is because of relatively poor pricing within the industry and that, as prices and the resulting returns rise, there may be more announcements of new plants being built.

Up until now, returns from chemical products have not been high enough to offset the cost of capital needed to build new plants. And, to a certain extent, capacity use rates have not been high enough that new plants are needed. Producers have been able to stretch existing capacity by increasing production efficiencies through modernization and debottlenecking techniques.

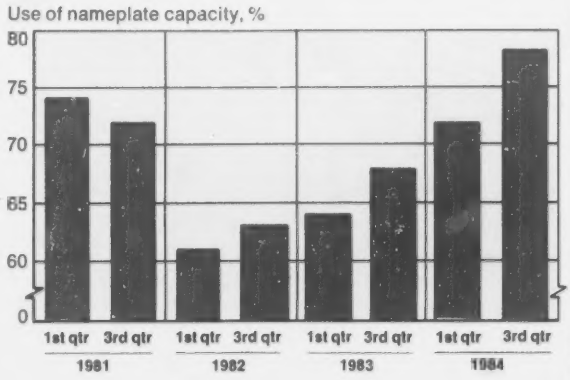
However, it's becoming apparent that plant announcements are going to have to come soon, since it typically takes two to three years to build a new chemical plant. Otherwise, some capacity idled during the recession will have to be brought back onstream to avoid shortages in some products in the next couple of years. Starting up idled capacity now seems the preferable choice in some areas, especially when the shut-down plants have been well maintained, simply because of interest rate forecasts and the resulting high cost of financing new plants.

Although the third-quarter decline in capacity use for polymers is

Though basic chemicals capacity has fallen, production has increased . . .



. . . sending capacity use rates upward once again



Sources: Industry and government data, C&EN estimates for 33 leading chemicals

Capacity utilization moved up well for basic chemicals in third-quarter 1984

Billions of lb unless otherwise noted[a]	Third-quarter 1984			First-quarter 1984			Third-quarter 1983		
	Capacity (nameplate)	Capacity use		Capacity (nameplate)	Capacity use		Capacity (nameplate)	Capacity use	
		Nameplate	Effective		Nameplate	Effective		Nameplate	Effective
Petrochemicals—olefins and aromatics[b]									
Ethylene	36.0	91%	100%	36.5	82%	91%	38.4	74%	82%
Propylene (chemical and polymer)	22.0	77	86	23.0	59	65	23.0	61	68
Butadiene[c]	4.5	58	64	4.5	51	56	4.5	58	64
Benzene (bg)	2.3	64	71	2.4	51	57	2.3	60	67
***p*-Xylene**	5.2	86	100	4.9	85	100	4.9	93	98
Petrochemicals—C_1 derivatives									
Ammonia (mt)[b]	17.5	89	93	17.8	88	91	18.7	64	67
Urea (mt)[b]	7.8	82	92	7.8	83	92	7.8	59	66
Methanol (bg)	1.7	74	83	1.9	60	67	1.8	63	70
Formaldehyde	9.2	61	65	9.2	56	59	9.2	56	59
Chlor-alkalies									
Chlorine (mt)	14.0	72	76	13.4	72	76	14.5	70	74
Caustic soda (mt)	14.9	72	76	14.3	68	72	15.5	66	70
Soda ash (mt)	11.0	74	78	11.0	77	81	10.7	81	85
Acids									
Sulfuric (mt)[b]	58.3	67	70	58.0	66	69	57.5	52	55
Phosphoric (P_2O_5, mt)[b,d]	12.5	87	91	12.5	82	86	12.5	56	69
Industrial gases									
Oxygen, **Nitrogen** (total, liquid ttd)	39.4	65	82	39.4	61	75	40.0	64	78
Carbon dioxide (ttd)[e]	19.0	73	81	19.0	67	74	19.6	64	70
Mineral-based organics[b]									
Sulfur (total, mmt)	17.0	55	—	17.0	31	—	16.0	50	—
Potash (mt)	2.2	90	—	2.2	55	—	2.2	50	—
Phosphorus	0.5	93	98	0.6	67	70	0.6	67	71
Plastics intermediates									
Styrene	8.2	95	110	7.8	92	108	8.1	77	91
Vinyl chloride	9.7	69	76	10.0	54	61	9.3	79	87
Toluene diisocyanate	0.7	84	93	0.7	102	113	0.7	83	92
Fiber intermediates									
DMT-PTA[f]	7.6	70	83	7.6	82	97	7.6	80	94
Ethylene oxide	7.0	86	95	7.4	84	93	7.3	75	84
Cyclohexane[b]	3.4	83	89	3.4	62	66	3.4	52	55
Adhesives, coatings intermediates									
Phenol	3.2	74	83	3.3	85	94	3.3	83	92
Vinyl acetate	2.4	99	105	2.4	87	92	2.4	83	88
Pigments									
Carbon black	3.3	87	96	3.3	86	96	3.3	73	81
Titanium dioxide	0.9	97	115	0.9	84	98	0.9	86	100
Solvents									
Acetone	2.8	59	66	2.8	67	75	3.0	67	74
Ethanol (mg)	210.0	88	98	240.0	78	91	240.0	59	62
Methylene chloride	0.8	65	72	0.8	39	77	0.8	71	79
AVERAGE		**78%**	**86%**		**72%**	**82%**		**68%**	**76%**

a bg = billions of gallons, mt = millions of tons, ttd = thousands of tons per day, mmt = millions of metric tons, mg = millions of gallons. b Substantial capacity currently shut down. c Total extraction capacity, which runs 25% more than basic production capacity. d Includes both wet-process and furnace-process capacity. e Excludes oilfield operations. f Dimethyl terephthalate and DMT equivalents of purified terephthalic acid. **Sources:** industry and government sources, C&EN estimates

based on preliminary figures, it is enough to cause some consternation. Polymers and especially fibers have long been considered bellwethers of the chemical industry. If a decline indeed has occurred, and capacity use rates have fallen in both the first and third quarters of this year, then it may mean that chemicals are once again in for some problems.

At least part of the decline probably can be accounted for by capacity increases getting ahead of production increases, especially for plastics, whose production capacity in the third quarter increased 4% from the first quarter of this year. That results in a drop in nameplate capacity use for plastics to 78% in the third quarter from 81% in the

Capacity utilization rates drop again for polymers

Billions of lb per year	Third-quarter 1984 Capacity (nameplate)	Third-quarter 1984 Capacity use Nameplate	Third-quarter 1984 Capacity use Effective	First-quarter 1984 Capacity (nameplate)	First-quarter 1984 Capacity use Nameplate	First-quarter 1984 Capacity use Effective	Third-quarter 1983 Capacity (nameplate)	Third-quarter 1983 Capacity use Nameplate	Third-quarter 1983 Capacity use Effective
PLASTICS									
Polyethylene, low density	10.3	79%	84%	10.1	83%	88%	10.1	81%	86%
Polyvinyl chloride	8.7	61	72	8.3	78	92	8.9	71	83
Polyethylene, high density	7.1	87	92	6.8	87	91	6.3	94	99
Polypropylene	5.4	91	101	5.3	90	100	5.1	86	96
Polystyrene	5.6	69	81	5.1	67	78	5.3	64	75
AVERAGE		**78%**	**86%**		**81%**	**90%**		**79%**	**88%**
SYNTHETIC FIBERS									
Filament yarn									
Polyester	1.5	74	79	1.5	84	90	1.6	88	93
Nylon	1.9	79	85	1.9	85	92	1.9	84	90
Olefin	1.1	62	65	1.1	63	67	1.1	71	75
Staple									
Polyester	2.8	78	83	2.8	82	87	2.7	89	95
Nylon	1.0	74	78	0.99	89	95	0.99	96	102
Acrylic	0.81	80	85	0.83	83	88	0.83	83	88
AVERAGE		**74%**	**79%**		**81%**	**86%**		**85%**	**91%**
OVERALL AVERAGE		**76%**	**83%**		**81%**	**88%**		**82%**	**89%**

Sources: Society of the Plastics Industry, Textile Economics Bureau, industry sources, C&EN estimates

first quarter, and from 79% in last year's third quarter.

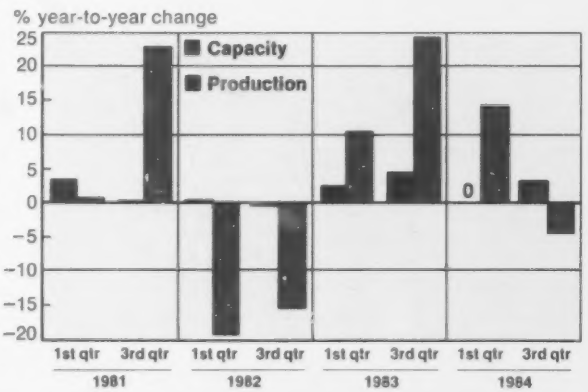
For polyvinyl chloride, capacity for which rose 5% between the first and third quarters, capacity use fell to 61% of nameplate capacity in the third quarter from 78% in the first quarter. But polystyrene, in spite of a 10% rise in capacity between those two quarters, had a rise to 69% of nameplate capacity in the third quarter from 67% in the first quarter.

Synthetic fibers are experiencing a different problem. Imports of foreign textiles are holding down demand for domestic fibers in spite of apparently healthy end-use markets. Capacity use as a percentage of nameplate capacity for synthetic fibers declined to 74% in the third quarter from an average of 81% in the first quarter of this year and 85% in the third quarter of 1983. The fall was led by a 15-percentage-point drop in nylon staple, used mainly for carpets, to 74% from 89% in the first quarter. This was followed by a 10-percentage-point fall for polyester yarn (for apparel use) to 74% from 84%. Much of the imported material is in the form of finished apparel goods.

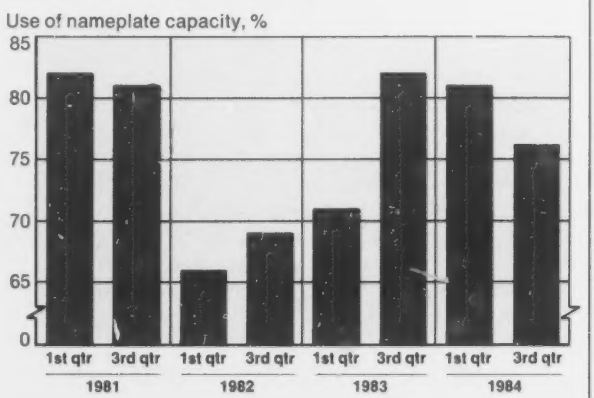
There also is a case to be made that if it were not for inventory building, capacity utilization in the third quarter would have been even lower for both synthetic fibers and for plastics. Stocks at producing plants increased for both of these product categories.

In contrast to the downstream polymers, however, capacity utilization for basic chemicals rose in the third quarter, with the average utilization rate as a percentage of nameplate capacity for 33 basic chemical products reaching 78%. As a percentage of effective capacity, the av-

Polymer capacity has increased, but output has fallen . . .



. . . driving capacity use rates down from a year earlier



Sources: Society of the Plastics Industry, Textile Economics Bureau, industry sources, C&EN estimates

C&EN capacity use indicator: the ground rules

Capacity use at chemical plants is difficult to measure and requires certain assumptions. These bring some order to the maze of variables affecting this critical indicator of the industry's health.

With the help of industry and government sources, C&EN measures capacity use as a percentage of both nameplate and effective maximums. Nameplate capacity is the official design capacity of plants. Effective capacity is the practical maximum after reductions for unplanned maintenance, corrosion problems, changes in product mix, and other influences. Although engineering companies and industry statistics groups try to make nameplate capacity data as real as possible, practical problems almost always reduce effective maximums to 85 to 95% of the official totals. For short periods, plants can run at more than 100% of effective top capacity, but such a rate doesn't last more than a few months.

Capacity use is given over as much of a calendar quarter as production data permit, with no seasonal adjustment. The figures are for plants actually operable. At present, some products such as ethylene, ethanol, chlorine, polystyrene, ammonia, and urea have plants temporarily shut down because of weak markets. These plants still are included in capacity totals. The totals exclude new plants just starting up and old plants out of operation for long periods because of accidents. As much as possible, capacity figures stay current with expansions.

Capacity data don't take into account other temporary fluctuations for fuel and electric power interruptions, equipment failure, and feedstock scarcity or substitution. The feedstock variables, for example, have been important in the past few years in ethylene production, altering maximum output for several coproducts such as propylene, butadiene, and benzene.

Products in C&EN's capacity use survey are the same as those in the Key Chemicals and Key Polymers series. These are the core products of the industry, the building blocks leading to downstream production of thousands of more specialized products.

erage use rate increased to 86% in the third quarter from 76% in the first quarter and 70% in last year's third quarter. Effective capacity, normally 85% to 95% that of nameplate capacity, is the rate that plants can run over long periods of time. Capacity use as a percentage of effective capacity can run more than 100%, but usually for only short periods.

In the third quarter, the average utilization rate for both the 20 organics and the 13 inorganics among those basic chemicals surveyed was 78% of nameplate capacity. For the organics, that percentage is up from 74% in the first quarter and from 68% in the third quarter last year. For the inorganics, it is up from 68% in the first three months of this year and from 66% a year before.

Led by the upsurge in the housing market, the highest capacity utilization rate for any product category in the third quarter was for pigments, where carbon black and titanium dioxide had an average capacity use of 92% of nameplate capacity. That's up from 85% in the first quarter and 80% in the third quarter last year.

The strong construction market also carried over to adhesives and coatings intermediates, where capacity use for phenol and vinyl acetate averaged 87% in the third quarter, up a bit from an equally strong 86% in the first quarter and from 83% in third-quarter 1983.

The apparent problems in synthetic fibers and in plastics did not hurt the intermediates for these two product categories. Average capacity use for plastics intermediates—styrene, vinyl chloride, and toluene diisocyanate—was a good 83%, the same as it was in the first quarter and up from 80% in the third quarter last year. Capacity use for fiber intermediates—dimethyl terephthalate and purified terephthalic acid, ethylene oxide, and cyclohexane—averaged 80% in the third quarter, up from 76% in the first quarter and from just 69% in 1983's third quarter.

The largest recovery among the basic chemicals surveyed came for the mineral-based inorganics—sulfur, potash, and phosphorus—for which capacity use averaged 79% in the third quarter, a large increase from the 51% in the first quarter and 56% in the third quarter a year ago.

The government's ending of its payment-in-kind crop set-aside program, though not helping much from the previous quarter, has boosted considerably capacity use from a year ago for many chemicals in the survey. For instance, capacity use for the major acids—sulfuric and phosphoric—averaged 77% of nameplate in the third quarter, up slightly from 74% in the first quarter. However, this is a substantial increase from the 59% capacity use in the third quarter of 1983—an extremely poor fertilizer year.

Capacity use of the two main organic fertilizers—ammonia and urea—also got a boost. Their average capacity use in the third quarter was 86%, the same as in the first quarter. However, in third-quarter 1983, capacity utilization for these two products averaged only 67%.

The survey also shows a healthy increase in capacity use for olefins and aromatics. Utilization rates for these chemicals, which have a large effect on industry fortunes, increased to 75% of nameplate capacity in the third quarter from just 66% in the first quarter this year and 69% in third-quarter 1983. Capacity use for these chemicals was helped by small shutdowns in ethylene, propylene, and benzene. There was a 6% increase in *p*-xylene capacity between the first and third quarters, but apparently all this was utilized, since capacity use was 86% in the third quarter and 85% in the first quarter. The shutdowns in ethylene, propylene, and benzene plus increased production caused capacity use in each of these products to increase, and in the case of ethylene to exceed 90% of nameplate. □